REMARKS

Claims 5-25, 27-56 are pending in this application. By this Amendment, claims 5-9, 11-15, 18-20, 22-25, 27-30, 32-34, and 36-37, and Figure 23 are amended; claims 1-4, and 26 are cancelled; and claims 38-56 are added. Support for the amendments can be found in the specification at, for example, page 9, lines 2-7; page 28, lines 8-11; page 3, lines 1-3; page 14, lines 11-16; page 5, lines 20-21; page 10, lines 9-21; page 11, lines 13-15; page 7, lines 12-22; and in original claims 1, 4, and 26. No new matter is added. Reconsideration of the application based upon the above amendments and the following remarks is respectfully requested.

I. Rejection Under 35 U.S.C. § 112

a. First Paragraph

The Office Action rejects claims 8-10 and 29-31 under 35 U.S.C. §112, first paragraph, as based on a disclosure, which is not enabling. Applicants' respectfully traverse the rejection.

The Office Action asserts that these claims are directed to the aspect ratio of the antennas, which according to the specification applies to rectangular antennas of the type disclosed in Figure 11. The Office Action further asserts that the limitation that these antennas are of this type is critical or essential to the practice of the invention, but is not included in the claims. Therefore, the claims are allegedly not enabled by the disclosure. The Office Action then asserts that this limitation must be included in dependent claims 8 or 29.

The specification recites, "For a flat antenna having a rectangular, circular or other shape, the aspect ratio is defined as the length of the antenna along the direction perpendicular to the inner wall divided by the length along the direction parallel to the inner wall. For a three-dimensional antenna, a projection of the antenna onto a plane parallel to the stage is created and the aspect ratio is defined as the length of the projection along the direction

parallel to the inner wall." (Present specification, page 9, lines 2-7). Thus, the aspect ratio of the RF antenna is applicable to not only a rectangular antenna but it is also applicable to antennas having other shapes, including circular and three-dimensional shapes. The aspect ratio of the RF antenna is also clearly defined in the specification for each of the various shapes. Thus, the present claims are enabled by the disclosure without adding any further limitations to claims 8 or 29.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

The Office Action also rejects claim 20 under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. By this Amendment, Figure 23 is amended to obviate the rejection.

The Office Action asserts that the claims contain subject matter that is not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention. The Office Action further asserts that, in claim 20, a capacitor located in proximity to an antenna is disclosed to detect voltage applied to the antenna but that this capacitor is not explained in the disclosure.

The specification recites, "As shown in Fig. 23, a bridge circuit 46 is connected to each of the pick-up coil 44 and the capacitor 45 to convert the alternating-current (AC) signal generated by the pick-up coil 44 and the capacitor 45 into a direct-current (DC) signal." (Present specification, page 28, lines 8-11). However, in Fig. 23, the capacitor was incorrectly designated as numeral 43 instead of the correct numeral 45. By this amendment, the capacitor in Fig. 23 is now correctly designated as numeral 45. Thus, a capacitor located in proximity to an antenna is now clearly defined in the disclosure.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

b. Second paragraph

The Office Action rejects claim 7 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. By this Amendment, claim 7 is amended to obviate the rejection.

The Office Action asserts that claim 7 recites the limitation "the groups" but that there is insufficient antecedent basis for this limitation in the claims. Claim 7 has been amended to recite "wherein each of the multiple RF antennas is divided into groups, each including one or more RF antennas, and a RF power is supplied to each RF antenna in parallel within each group . . .."

Thus, claim 7 has sufficient antecedent basis and particularly points out and distinctly claims the subject matter, which Applicants regard as the invention.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

II. <u>Rejections Under 35 U.S.C. § 102(b) or 35 U.S.C. §103</u>

a. Masaji

The Office Action rejects claims 1-3, 11-14, 16, 23-26, 32-34, and 36-37 under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Masaji et al. ("Masaji"). By this amendment, claims 1-3 are cancelled, which obviates the rejection as to these claims. However, Masaji does not disclose, teach or suggest, every limitation of independent claims 11, 13, 32 and 34. Thus, the rejection is respectfully traversed.

Masaji fails to disclose, teach or suggest, every limitation of independent claims 11 and 32. At most, Masaji discloses an antenna installed inside a vacuum container for the purpose of plasma generation (Masaji, abstract). Masaji further discloses a stage located

inside the vacuum chamber (Masaji, Drawing 1). Masaji also discloses multiple antennas attached to the sidewalls of the vacuum chamber and arranged parallel to the stage (Masaji, Drawing 11, 18a-f). However, Masaji fails to disclose, teach or suggest, multiple RF antennas provided on an inner wall surface of the vacuum chamber so as to surround an inner space of the vacuum chamber. Masaji further fails to disclose, teach or suggest, the limitation that adjacent electrodes of one or more pairs of adjacent RF antennas have the same polarity.

Masaji also fails to disclose, teach or suggest, every limitation of independent claims 13 and 34. As discussed above, Masaji discloses an antenna installed inside a vacuum container for the purpose of plasma generation, a stage located inside the vacuum chamber, and multiple antennas attached to the sidewalls of the vacuum chamber and arranged parallel to the stage (Masaji, abstract; Drawing 1; Drawing 11, 18a-f). However, Masaji fails to disclose, teach or suggest, the limitation of an impedance element connected to the RF antennas that regulates a current or voltage of each RF antenna.

Claims 12, 14, 16, 23-26, 33, and 36-37 depend from independent claims 11, 13, 32, and 34, and non-rejected independent claim 5. Because Masaji fails to disclose, teach or suggest, the features recited in independent claims 5, 11, 13, 32, and 34, dependent claims 12, 14, 16, 23-26, 33, and 36-37 are patentable for at least the reasons that claims 5, 11, 13, 32, and 34 are patentable, as well as for the additional features they recite.

Accordingly, the cited reference fails to disclose, teach or suggest, plasma generators and plasma control methods, as claimed. The reference thus would not have anticipated or rendered obvious the claimed invention.

Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

b. Yamakoshi

The Office Action rejects claims 1-3, 11-14, 16, 18, 24-26, and 32-37 under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Yamakoshi et al. ("Yamakoshi"). By this amendment, claims 1-3 are cancelled, which obviates the rejection as to these claims. However, Yamakoshi does not disclose, teach or suggest, every limitation of independent claims 11, 13, 32 and 34. Thus, the rejection is respectfully traversed.

Yamakoshi fails to disclose, teach or suggest, every limitation of independent claims 11 and 32. At most, Yamakoshi discloses "a discharge plasma generating method including (a) opposing a discharge electrode having a substantially plane discharge portion to a substrate to be processed in a vacuum reaction vessel such that the discharge electrode and the substrate are substantially parallel to each other, (b) evacuating the vacuum reaction vessel and supplying a process gas to a space between the discharge electrode and the substrate . . ." (Yamakoshi, abstract). Yamakoshi further discloses a ground electrode that includes a mechanism for holding a glass substrate to be processed (Yamakoshi, page 8, paragraph 0140; Fig. 29, 3, G). Yamakoshi discloses that there is a single ladder electrode opposing the ground electrode with 20 mm between them (Yamakoshi, page 8, paragraph 0140). Yamakoshi's ladder electrode is formed by assembling a plurality of parallel longitudinal rods and one or more pairs of parallel lateral rods into the form of a lattice (Yamakoshi, page 8, paragraph 0141; Fig. 8, 303-305). However, Yamakoshi is silent as to how and where the ladder electrode is attached to the discharge plasma generating apparatus.

Yamakoshi thus fails to disclose multiple RF antennas provided on an inner wall surface of the vacuum chamber so as to surround an inner space of the vacuum chamber, where adjacent electrodes of one or more pairs of adjacent RF antennas have the same polarity.

Yamakoshi also fails to disclose, teach or suggest, every limitation of independent claims 13 and 34. As discussed above, Yamakoshi discloses "a discharge plasma generating method including (a) opposing a discharge electrode having a substantially plane discharge portion to a substrate to be processed in a vacuum reaction vessel such that the discharge electrode and the substrate are substantially parallel to each other, (b) evacuating the vacuum reaction vessel and supplying a process gas to a space between the discharge electrode and the substrate . . ." (Yamakoshi, abstract). Yamakoshi further discloses a ground electrode that includes a mechanism for holding a glass substrate, and a single ladder electrode that opposes the ground electrode with 20 mm between them (Yamakoshi, page 8, paragraph 0140; Fig. 29, 3, G). Yamakoshi's ladder electrode is formed by assembling a plurality of parallel longitudinal rods and one or more pairs of parallel lateral rods into the form of a lattice (Yamakoshi, page 8, paragraph 0141; Fig. 8, 303-305). However, Yamakoshi does not teach or suggest a plate-shaped conductor connected to the multiple RF antennas in parallel and arranged outside the vacuum chamber.

Yamakoshi additionally discloses an impedance matching circuit (Yamakoshi, page 8, paragraphs 0143-0144). However, Yamakoshi fails to disclose, teach or suggest an impedance element connected to the RF antennas that regulates a current or voltage of each RF antenna.

Claims 12, 14, 16, 18, 24-26, 33, and 35-37 variously depend from independent claims 11, 13, 32, and 34, and non-rejected independent claim 5. Because Yamakoshi fails to disclose, teach or suggest, the features recited in independent claims 5, 11, 13, 32, and 34, dependent claims 12, 14, 16, 18, 24-26, 33, and 35-37 are patentable for at least the reasons that claims 5, 11, 13, 32, and 34 are patentable, as well as for the additional features they recite.

Accordingly, the cited reference fails to disclose, teach or suggest, plasma generators

and plasma control methods, as claimed. The reference thus would not have anticipated or rendered obvious the claimed invention.

Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

III. Rejections Under 35 U.S.C. §103

a. Masaji in view of Koji in further view of Kojin Nakagawa

Claims 4-6 are rejected under 35 U.S.C. §103(a) as being unpatentable over Masaji et al. ("Masaji") in view of Koji et al. ("Koji"). Claims 5-6 are rejected under 35 U.S.C. §103(a) as being unpatentable over Masaji et al. ("Masaji") in view of Koji et al. ("Koji") and in further view of Kojin Nakagawa. Because the rejections are related they are addressed together. By this amendment, claim 4 is cancelled, which obviates the rejection as to this claim. Applicants respectfully traverse the rejections.

Masaji fails to teach or suggest every limitation of independent claim 5. As discussed above, Masaji discloses an antenna installed inside a vacuum container for the purpose of plasma generation, a stage located inside the vacuum chamber, and multiple antennas attached to the sidewalls of the vacuum chamber and arranged parallel to the stage (Masaji, abstract; Drawing 1; Drawing 11, 18a-f). Masaji additionally teaches that parallel connection of each straight-line-like antenna is carried out on the outside of a vacuum housing and a blocking capacitor is connected with the adjustment machine (Masaji, paragraph 0050).

Masaji thus fails to teach or suggest the limitation of a plate-shaped conductor connected to the multiple RF antennas in parallel and arranged outside the vacuum chamber. Masaji also fails to teach or suggest the limitation that a distance between a connection point at which the power source supplying the power to the RF antennas is connected to the plate-shaped conductor and each connection point at which each RF antenna is connected to the plate-shaped conductor is made shorter than the quarter wavelength of the RF wave.

Koji does not overcome the deficiencies of Masaji. At most, Koji teaches that two or more conducting bars are connected between a metal frame of the high-tension side for supplying electric power in high frequency power, and a metal frame of the earth side (Koji, paragraph 0019). Koji thus fails to teach or suggest a plate shaped conductor connected to the multiple RF antennas in parallel.

In the present claims, having the plate-shaped conductor arranged outside the vacuum chamber enables the heat generated from the RF antennas to be efficiently released to the outside of the vacuum chamber. This contributes to the stability of the impedance by alleviating the increase in electric resistance that occurs when the temperature at the connection of the antenna conductor rises because of the power supply. In Drawing 2, Koji shows that the metal frames are located inside the vacuum housing (Koji, paragraph 0018-0019, Drawing 2). Koji thus fails to teach or suggest that a plate-shaped conductor is arranged outside the vacuum chamber.

Kojin Nakagawa does not overcome the deficiencies of Masaji and Koji. At most, Kojin Nakagawa teaches that the distance between the two optional points at the longest distance from each other on the peripheral part of the electrode body facing the space to produce plasma is controlled to $\geq$ ¼ of the wavelength of the high frequency power (Kojin Nakagawa, abstract). Kojin Nakagawa thus fails to teach or suggest a distance between a connection point at which the power source supplying the power to the RF antennas is connected to the plate-shaped conductor and each connection point at which each RF antenna is connected to the plate-shaped conductor is made shorter than the quarter wavelength of the RF wave. Kojin Nakagawa also fails to teach or suggest a plate shaped conductor connected to the multiple RF antennas in parallel and arranged outside the vacuum chamber.

Claim 6 depends from independent claim 5. Because Masaji, Koji and Kojin Nakagawa fail to teach or suggest, alone or in combination, the features recited in

independent claim 5, dependent claim 6 is patentable for at least the reasons that claim 5 is patentable, as well as for the additional features it recites.

Accordingly, any combination of the cited references fails to teach or suggest a plasma generator, as claimed. The references thus would not have rendered obvious the claimed invention.

Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

b. Masaji in view of Minoru Kanda

Claims 15-16 are rejected under 35 U.S.C. §103(a) as being unpatentable over Masaji et al. ("Masaji") in view of Minoru Kanda et al. ("Minoru Kanda"). Applicants respectfully traverse the rejection.

The above discussion with respect to Masaji as applied to claim 13 is incorporated herein by reference.

Minoru Kanda, cited only against dependent claims 15-16, does not teach or suggest the limitation of an impedance element connected to the RF antennas and regulating a current or voltage of each RF antenna. Therefore, Minoru Kanda does not overcome the deficiencies of Masaji, as discussed above.

Claims 15-16 depend from independent claim 13. Because Masaji and Minoru Kanda fail to teach or suggest, alone or in combination, the features recited in independent claim 13, dependent claims 15-16 are patentable for at least the reasons that claim 13 is patentable, as well as for the additional features they recite.

Accordingly, any combination of the cited references fails to teach or suggest a plasma generator, as claimed. The references thus would not have rendered obvious the claimed invention.

Accordingly, reconsideration and withdrawal of the rejection are respectfully

requested.

c. Masaji in view of Choi

Claim 17 is rejected under 35 U.S.C. §103(a) as being unpatentable over Masaji et al. ("Masaji") in view of Choi et al. ("Choi"). Applicants respectfully traverse the rejection.

The above discussion with respect to Masaji as applied to claim 13 is incorporated herein by reference.

Choi, cited only against dependent claim 17, does not teach or suggest the limitation of an impedance element connected to the RF antennas and regulating a current or voltage of each RF antenna. Therefore, Choi does not overcome the deficiencies of Masaji, as discussed above.

Claim 17 variously depends from independent claim 13. Because Masaji and Choi fail to teach or suggest, alone or in combination, the features recited in independent claim 13, dependent claim 17 is patentable for at least the reasons that claim 13 is patentable, as well as for the additional features it recites.

Accordingly, any combination of the cited references fails to teach or suggest a plasma generator, as claimed. The references thus would not have rendered obvious the claimed invention.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

d. Masaji or Yamakoshi in view of Nakamura

Claims 19 and 21 are rejected under 35 U.S.C. §103(a) as being unpatentable over Masaji et al. ("Masaji") or Yamakoshi ("Yamakoshi") in view of Nakamura et al. ("Nakamura"). Applicants respectfully traverse the rejection.

The above discussions with respect to Masaji and Yamakoshi as applied to claim 13 are incorporated herein by reference.

Nakamura, cited only against dependent claims 19 and 21, does not teach or suggest the limitation of an impedance element connected to the RF antennas and regulating a current or voltage of each RF antenna. Nakamura also does not teach or suggest a plate-shaped conductor connected to the multiple RF antennas in parallel and arranged outside the vacuum chamber. Therefore, Nakamura does not overcome the deficiencies of Masaji and Yamakoshi, as discussed above.

Claim 19 and 21 variously depends from independent claim 13. Because Masaji, Yamakoshi and Nakamura fail to teach or suggest, alone or in combination, the features recited in independent claim 13, dependent claims 19 and 21are patentable for at least the reasons that claim 13 is patentable, as well as for the additional features they recite.

Accordingly, any combination of the cited references fails to teach or suggest a plasma generator, as claimed. The references thus would not have rendered obvious the claimed invention.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

e. Masaji or Yamakoshi in view of Koji Oku

Claim 22 is rejected under 35 U.S.C. §103(a) as being unpatentable over Masaji et al. ("Masaji") or Yamakoshi ("Yamakoshi") in view of Koji Oku et al. ("Koji Oku"). Applicants respectfully traverse the rejection.

The above discussions with respect to Masaji and Yamakoshi as applied to claim 13 are incorporated herein by reference.

Koji Oku, cited only against dependent claim 22, does not teach or suggest the limitation of an impedance element connected to the RF antennas and regulating a current or voltage of each RF antenna. Koji Oku also does not teach or suggest a plate-shaped conductor connected to the multiple RF antennas in parallel and arranged outside the vacuum

chamber. Therefore, Koji Oku does not overcome the deficiencies of Masaji and Yamakoshi, as discussed above.

Claim 22 variously depends from independent claim 13. Because Masaji, Yamakoshi and Koji Oku fail to teach or suggest, alone or in combination, the features recited in independent claim 13, dependent claim 22 is patentable for at least the reasons that claim 13 is patentable, as well as for the additional features it recites.

Accordingly, any combination of the cited references fails to teach or suggest a plasma generator, as claimed. The references thus would not have rendered obvious the claimed invention.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

f. Masaji or Yamakoshi in view of Kojin Nakagawa

Claims 27-28 are rejected under 35 U.S.C. §103(a) as being unpatentable over Masaji or Yamakoshi in view of Kojin Nakagawa. Applicants respectfully traverse the rejections.

Masaji fails to teach or suggest every limitation of independent claim 27. As discussed above, Masaji discloses an antenna installed inside a vacuum container for the purpose of plasma generation, a stage located inside the vacuum chamber, and multiple antennas attached to the sidewalls of the vacuum chamber and arranged parallel to the stage (Masaji, abstract; Drawing 1; Drawing 11, 18a-f). Masaji additionally teaches that parallel connection of each straight-line-like antenna is carried out on the outside of a vacuum housing and a blocking capacitor is connected with the adjustment machine (Masaji, paragraph 0050).

Masaji thus fails to teach or suggest the limitation of a plate-shaped conductor connected to the multiple RF antennas in parallel and arranged outside the vacuum chamber. Masaji also fails to teach or suggest the limitation that a state of plasma is controlled by

regulating the distance between a connection point at which the power source supplying the power to the RF antennas is connected to the plate-shaped conductor and each connection point at which each RF antenna is connected to the plate-shaped conductor.

Yamakoshi does not overcome the deficiencies of Masaji. As discussed above, Yamakoshi discloses "a discharge plasma generating method including (a) opposing a discharge electrode having a substantially plane discharge portion to a substrate to be processed in a vacuum reaction vessel such that the discharge electrode and the substrate are substantially parallel to each other, (b) evacuating the vacuum reaction vessel and supplying a process gas to a space between the discharge electrode and the substrate . . ." (Yamakoshi, abstract).

Yamakoshi further discloses a ground electrode that includes a mechanism for holding a glass substrate, and a single ladder electrode that opposes the ground electrode with 20 mm between them (Yamakoshi, page 8, paragraph 0140; Fig. 29, 3, G). Yamakoshi's ladder electrode is formed by assembling a plurality of parallel longitudinal rods and one or more pairs of parallel lateral rods into the form of a lattice (Yamakoshi, page 8, paragraph 0141; Fig. 8, 303-305). However, Yamakoshi does not teach or suggest a plate-shaped conductor connected to the multiple RF antennas in parallel and arranged outside the vacuum chamber. Yamakoshi further does not teach or suggest that a state of plasma is controlled by regulating the distance between a connection point at which the power source supplying the power to the RF antennas is connected to the plate-shaped conductor and each connection point at which each RF antenna is connected to the plate-shaped conductor.

Kojin Nakagawa does not overcome the deficiencies of Masaji and Yamakoshi. At most, Kojin Nakagawa teaches that the distance between the two optional points at the longest distance from each other on the peripheral part of the electrode body facing the space

to produce plasma is controlled to ≥ ¼ of the wavelength of the high frequency power (Kojin Nakagawa, abstract).

Kojin Nakagawa also teaches "when the magnitude of the front face which countered the plasma production space of an electrode object is sufficiently smaller than the wavelength of high-frequency power, the problem of the heterogeneity of the plasma consistency resulting from the wavelength of high frequency power is not produced. However, if the magnitude of the front face of an electrode object approaches the die length of the quarter of the wavelength of high-frequency power, the problem of the heterogeneity of a plasma consistency will actualize gradually." (Kojin Nakagawa, paragraph 0007). Kojin Nakagawa thus fails to teach or suggest that a state of plasma is controlled by regulating the distance between a connection point at which the power source supplying the power to the RF antennas is connected to the plate-shaped conductor and each connection point at which each RF antenna is connected to the plate-shaped conductor. Kojin Nakagawa also fails to teach or suggest a plate shaped conductor connected to the multiple RF antennas in parallel and arranged outside the vacuum chamber.

Claim 28 depends from independent claim 27. Because Masaji, Yamakoshi and Kojin Nakagawa fail to teach or suggest, alone or in combination, the features recited in independent claim 27, dependent claim 28 is patentable for at least the reasons that claim 27 is patentable, as well as for the additional features it recites.

Accordingly, any combination of the cited references fails to teach or suggest a plasma control method, as claimed. The references thus would not have rendered obvious the claimed invention.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

IV. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of this application are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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JAO:JLR/sxl

Attachments:
Replacement Sheet (Figs. 22 and 23)
Petition for Extension of Time
Amendment Transmittal

Date: March 3, 2008

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